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ABSTRACT

This document considers the curriculum development process as interrelated with the process of change and emphasizes the need to integrate an international perspective into the curriculum development process. It explores: (1) technological change and an international perspective on curriculum; (2) Armstrong's seven-stage model of the tasks that are representative of many generic curriculum development models; (3) Rogers' five-step model of the change process in organizations; (4) the Armstrong and Rogers models as complementary in affecting change; and (5) how curriculum development and the process of change are being managed in five Canadian provinces (British Columbia, Alberta, Saskatchewan, Manitoba, and Ontario). The document includes 15 references, 3 tables, and a figure. (CML)

CURRICULUM DEVELOFMENT AND THE PROCESS OF CHANGE

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Curriculum Development and the Process of Change *

Executive Summary

The implementation of technology education programs requires not only an understanding of the curriculum development process but also an understanding of the process of change in organizations. To address the curriculum development and change process in technology education five areas were explored: (a) technological change and an international perspective on curriculum development, (b) Armstrong's seven stage model of the tasks that are representative of many generic curriculum development models, (c) Roger's five step model of the change process in organizations, (d) the Armstrong and Rogers models as complementary in affecting change, and finally (e) how curriculum development and the process of change were being managed in five Canadian provinces.

Introduction

This paper has two purposes. The first is to consider the curriculum development sequence as integral with the process of change. Armstrong's (1989) seven stage model of the tasks that are representative of many generic curriculum development models and Roger's (1983) five step model of the change process in organizations will be considered together to examine how curriculum implementation and the process of change go hand-in-hand. While this fact seems blatantly obvious, a good many curriculum innovations have fallen by the wayside for lack of attention to the details of the process of change itself (Kelly, 1986; Cochran, 1971).

The second purpose, is to emphasize the need to integrate an international perspective into the curriculum development process. As the world rapidly becomes a global village with interlocking economies, what do we teach children about technology and the workplace? What will the survival skills of the next century be? These questions will be address through illustrations of contemporary applications of technology, identification of the resulting economic impacts, and examples of how technology education curriculum development were being managed in five Canadian provinces.

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Change and Curriculum Development

Addressing the survival skills of the next century may begin by taking stock of current state-of-the-art applications of technology. Daggett (1988) used a listing of technological examples from the international arena to illustrated the need for education to address contemporary technology skills. Two examples follow.

An insurance company in New York is getting their day-to-day word processing done in China for approximately one seventh of the cost of having it done in their American office. The total cost of labor and satellite communication with China is $1.16 per page as opposed to almost $8.00 per page in the U.S.A. home office. This international slight of page can be accomplished in approximately three minutes. The economic advantage is undeniable.

In Japan, a seamless dress or suit can be custom made to exact measurements in three minutes using optical character readers and laser for joining the materials. Again, the implications for the North American work force are apparent.

These examples emphasize the globalization of technology. This international focus has resulted in four structural changes in the United States economy. Daggett (1989) noted:

1. The jobs are not where they used to be. The service sector now accounts for the majority of jobs. Further, 70% of these jobs are at the low end of the wage scale.

2. A job expectation gap exists. As a society, we still expect the relatively high wages formerly paid by industrial sector jobs. However, the majority of the new jobs are in low paying service sector jobs such as fast food and health care.

3. Rapid Technological change is the norm. Educationally, you can't keep up with applications because new and improved equipment appears to rapidly. For example, how many versions and updates of your current word processing software have been released in the last 18 months? Education must focus on: concepts, principles, and systems.

4. How the work is done is changing. The present trend is towards job automation where the computer does the entire job. Two common examples are automatic teller machines and computerized rent-a-car kiosks. This automation trend is being extended to other service sector jobs. McDonalds, currently the nations largest employer, is testing completely automated food service equipment. A prototype now in use by McDonalds will deliver a of hamburgers in

15 seconds, cooked to the customers specifications, without ever being touched by human hands. This suggests that the new service jobs will be in the more highly skilled areas of equipment maintenance and costumer public relations.

The Complexity of Curriculum Change

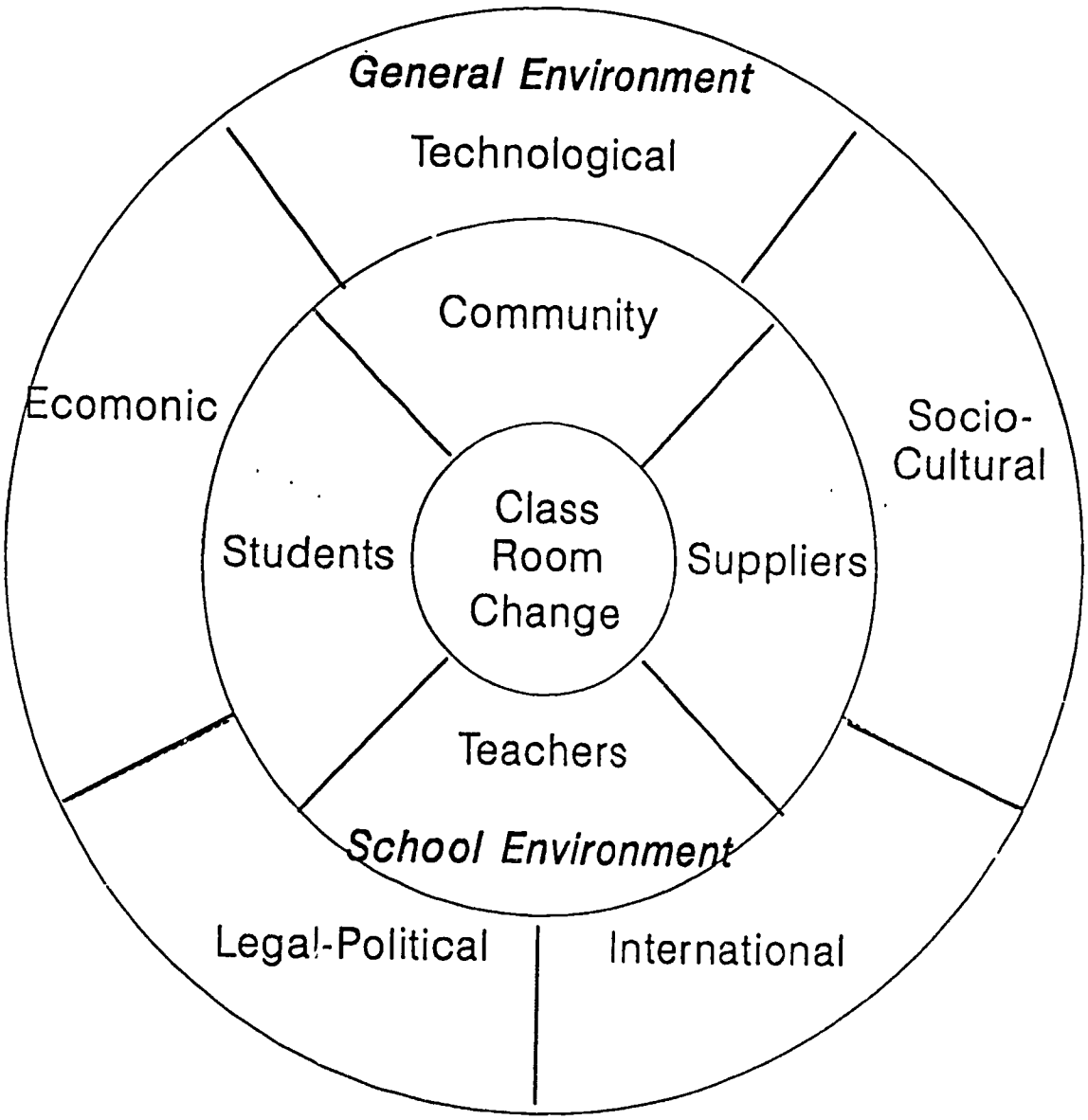
The point of forgoing examples is to emphasis that job skills, even in service sector, are rapidly changing. As technologies continually reshape the work world, a large number of schools are still teach typewriting, sewing, and other rapidly disappearing craft skills. With a world of change and wonder to work from and with, how can the essence of technology be translated into curriculum? And then, how can the curriculum be translated into effective practice in a school district?

Figure 1 identifies some of the inputs at work in the curriculum development process and suggests an open system where the school environment and the general environment interact. Note that the Figure 1 is shaped like a target. At the center of Figure 1 is the goal of the curriculum development effort, effective classroom change. The impetus for curriculum change is often a response to changes in one or more of the general environment arenas: (a) technological, (b) socio-cultural, (c) international, (d) legal-political, and/or (e) economic.

Once the need for change has been identified, a curriculum development process may be initiated. The curriculum materials developed then have to be implemented in the school. At this point, they are either nurtured or inhibited by the constituents of the school environment (a) teachers, (b) students, (c) suppliers, and (d) the community. In this way the general environment and the school environment interact to both create the need for change and to facilitate the process of change. To look at the this process more closely, the Armstrong (1989) curriculum development model and Rogers (1983) model of the change process in organizations will be examined.

Figure 1

Curriculum Change



Adapted from R. L. Daft, Management, 1988.

Armstrong's Curriculum Development Model

This curriculum development model was synthesized by Armstrong (1989) as being representative of the task identified in many curriculum development efforts. According to Armstrong, curriculum development should be dynamic and circular. That is, as one projects life ends in evaluation and revision the next cycle begins with the need to re-evaluate the original needs and purposes. Each of the seven tasks are outlined below.

1. Identify needs and purposes. One way to approach this task is through a discrepancy analysis in which "what is" is considered beside "what ought to be." This analysis will provide the focus for the remaining development activities.

2. Select and organize participants. The literature on effective change suggests that all stakeholders should have an opportunity for meaningful input. For example, the Calgary Board of Education's study of technology and living skills involved not only educational professionals, but parent groups, students, and the general public through the newspaper. In addition, outside resources may be required. If you are trying to create a new technology education curriculum, then perhaps futurists should be involved. The New York Futuring Project used this approach (Hacker, 1990).

3. Develop a master program management scheme. The scale of the management scheme must obviously suite the size of the project. Revising a philosophy statement would not likely require a master management scheme. However, a large scale project such as the change from industrial education to a state-wide technology education program would clearly require a sophisticated master management plan to assure the quality of the finished product. The management scheme must address not only subject specific concerns, but also how the end product will fit with other subjects and articulation with post-secondary institutions and with the world of work.

4. Develop components needed for each setting. These may include some or all of the following products: philosophy statement, rationale, scope and sequence documents, grade level or course plans, and instructional unit plans. Again the scope depends on the size of the project. A new technology education program would clearly require several years to develop the necessary documentation.

5. Pilot test, assess, and reorganize. Getting to a finalized curriculum package will likely require several cycles of pilot testing and revision. Armstrong (1989) noted that "pilot testing involves identification of a small sample of final users who react to elements of

what has been developed" (p. 35). These reactions are then analyzed by the curriculum development team and used to assess and reorganize curriculum materials to produce materials that are ready for implementation.

6. Disseminate and implement. While it is difficult to emphasis one stage in the curriculum development process over the others, all is for not if the curriculum materials are not put into use as intended. What is required at this stage is a plan to get the curriculum materials package to each user, support and monitor their use, and encourage their continuance. Armstrong (1989) suggests several approaches that are commonly used to encourage the change that curriculum implementation implies. These approaches include (a) training (b) modeling, (c) logic, (d) bureaucratic, and (e) affiliation. (For further discussion on implementing curriculum change see Armstrong, 1989, p. 199-225.)

7. Evaluate and revise. With the curriculum in operation its effectiveness must be assessed. Information from evaluation can be used to improve program weaknesses and to provide a data base for future curriculum revisions. Some widely used evaluation models are Tyler's (1949) objective based model, Provus's (1971) discrepancy model, Stufflebeams's (1971) CIPP model, and Stake's (1975) responsive model. All of these models have their advantages and disadvantages, therefore evaluation should be tailored to the needs of the specific curriculum project.

When curriculum development is conceptualized as a circular or on-going process, then evaluation and revision signal the need to once more examine the needs and purposes of the program. The underlying assumption in any curriculum development model is that change will occur.

The Process of Change

How can change be encouraged? The barriers to change and Rogers (1983) model of change in organizations will be explored to answer this question.

Barriers to Change

Understanding the barriers to change is critical to the success of the change. As Sarason (1971) noted identifying the barriers provides a starting point for solving the problem and gives one hope that the problem does indeed have solutions. In an organization, these barriers can be summed up as follows:

1. The needs of the individuals that make up the organization. Often conflicting, these include the needs of students, parents, teachers, principals, district administration, and school board members.

2. The organizational structure. Whose job has to change to accommodate the curriculum change? Is a new supervisor needed, or a current supervisor made redundant?

3. The relationship of the organization to the community environment in which it operates. What does the community want? Are "back to the basics" still king?

Rogers Model of Change in Organizations

Rogers (1983) developed a five step model of the change process that addressed these organizational concerns. The five steps in the model are divided into two stages: initiation and implementation.

Initiation Stage. During the initiation stage, organizational activities center around the information-gathering, conceptualizing, and planning that is required to make the decision to change. The two steps included at this stage are: (a) agenda setting, where the initial idea search occurs and the motivation to change is generated; and (b) matching, where an organizational problem and possible solutions are analyzed for compatibility.

The initiation stage is a problem solving exercise. First, the organization begins to realize that a problem exists. For example, industrial arts programs were generally faced with declining enrollments. At the same time, many studies cited the need for students to possess increased scientific and technological literacy. In response, the field started to focus on technology education as an emergent solution to both problems.

Implementation Stage. The second stage, implementation, begins after the decision to make the change has been made by the organization. This stage includes the decisions, actions, and procedures involved in putting an innovation into regular use. The implementation stage includes the last three steps: (c) restructuring the innovation and the organization to accommodate the change; (d) clarifying the innovation as it is put into regular use; and finally (e) maintaining the change as an integral part of the ongoing activities of the organization.

How do these last three steps relate to the implementation of technology education? Imagine the perfect environment in which to

teach technology education. New facilities, unlimited financial support from administration, new technology learning activities that work perfectly, and one day of inservice per week, during the week, is offered to keep you abreast of new technological developments.

Now back to reality; an industrial arts shop already exists in your school and can be modified to fit the demands of the new program! Your budget is still $300.00 per year, but due to the success of the program your enrollment is increasing! As you put the program into use, you find that some activities work and some don't. You chalk this up to experience and modify the activity for next time. And finally, both inservice days this year are on Saturday!

Clearly, opportunities exist for this curriculum change to go awry. The value of Rogers' model is that it provides curriculum implementors with an organizing tool for integrating the change process with the desired curriculum change.

Using Rogers Model

If Rogers' Model is used as a road map for change, what specific procedures and practices will be observed at each stage? Two examples are presented to help clarify the Rogers Model. Table 1 presents a listing of the ways that teachers participated in the curriculum change to technology education in New York (Boser, 1990). Table 2, adapted from McConaghy (1990), compares the major steps undertaken by two Canadian provinces in order to completely revise their curriculum. In this second example note the timeline for change in each province and consider your comfort level with the pace of change in each province.

Table 1

The Ways that New York Teachers Participated in Each Stage of the Change Process.

	Stage and Activities	Number Participating (n=10)
1.	**Agenda setting**	
	Participated in the Futuring Project	6
2.	**Matching**	
	Attended teacher-trainer summer program at State University College at Oswego	9
	State curriculum writing teams	2

Table 1 continued

	Pre-pilot of curriculum materials	4
	Conducted pilot test programs	5
3.	**Reshaping the Innovation and Organization**	
	Developed instructional activities to match curriculum documents	4
	Wrote items for state-wide proficiency exams	2
	Provided inservice activities for other teachers	9
	Attended voluntary inservice training offered through state, regional, college, and professional sources	10
	Adapted state curriculum documents to local needs	2
	Selected textbooks	7
	Modified:	
	Class schedules	4
	Laboratory organization	9
	Instructional materials and methods	9
	Equipment inventories	9
4.	**Clarifying the Change**	
	Provide inservice training	9
	School and community promotion of technology education	3
5.	**Maintaining the Change**	
	Provide inservice training through Technology Teacher Network	7
	Participated in inservice activities	9

Table 2

Process of Curriculum Change in Two Canadian Provinces.

British Columbia	Saskatchewan
Agenda Setting Royal Commission (15 months) 1987-1988. Released, Policy Directions in early 1989.	**Agenda Setting** 1981-84 - Advisory council representing constituent groups was created. - Discussion paper sent to every house with a school aged child.
Matching Late 1989, Year 2000: A curriculum assessment and reform framework for the future. Result: Teachers welcomed and supported the concepts, but were unhappy about the timeline. Not enough time for genuine consultation among government, education community, and the public.	**Matching** - 34 public meetings resulted in 40,000 pieces of data. - 1984 Report: Directions, summary of recommendations and model for curriculum design, implementation, evaluation, and maintenance.
Implementation Mandated change of elementary curriculum by 1991.	**Implementation** (10 yr. plan) 1988 - Core curriculum that included: - required areas of study. - AND Common essential elements (CEL's) that are woven into all courses. These include (a) communication, (b) numeracy, (c) critical and creative thinking, (d) technological literacy *, (e) personal and social values and skills, and (f) independent learning skills. 1989-90 - Begin incorporating CEL's into regular courses. - Begin inservice professional development using teachers-teaching-teachers.

Adapted from McConaghy (1990), *Curriculum Reform in Saskatchewan.*

Fitting the Two Models Together

Do these two models fit together? Without trying and force a perfect fit there are a lot of complementary features which favor the incorporation of a curriculum development model with a model that considers change as a process. A review of a number of the major industrial education curriculum projects from the 1960s and 1970s (Kelly, 1986; Cochran, 1971) showed that projects that succeeded had detailed plans for project diffusion that were backed with adequate funding. You may remember, and even still see, Industrial Arts Curriculum Project (IACP) programs; while a host of other innovative curriculum projects are remembered only as footnotes in technology education foundation courses. The moral of the story is that the process of change must be considered as a major component of curriculum development. Figure 2 puts the two models in perspective with both the inputs to the process of change and the developmental aspect of time. Table 3 below notes the commonalities and complementary features of the two models.

Figure 2
Inputs, Change, and Curriculum Development

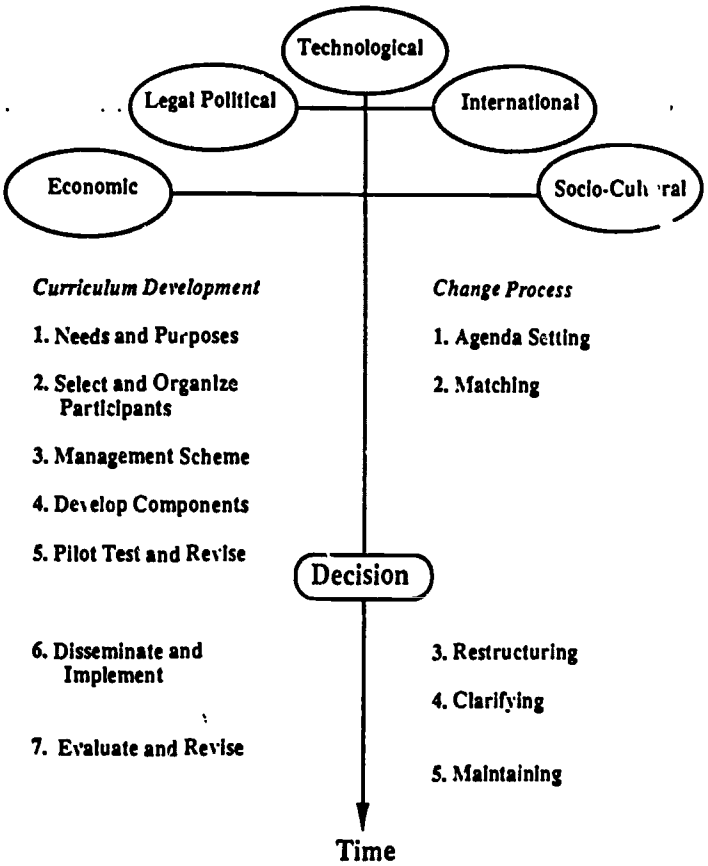


Table 3

Fitting the Two Models Together

	Rogers:		Armstrong:
	Initiation of Change		
(a)	Agenda setting - where the initial idea search occurs and the motivation to change is generated; and	1)	Identify needs and purposes
		2)	Select and organize participants
(b)	Matching - possible solutions are analyzed for compatibility.		
	Decision to Change		
	The second stage, implementation, begins after the decision to make the change has been made by the organization and includes the decisions, actions, and procedures involved in putting an innovation into regular use.		
	Implementation of Change		
	Rogers		Armstrong
(c)	Reshape the innovation and the organization to accommodate the change	3)	Develop a master program management scheme
		4)	Develop components needed for each setting? (Scope & Sequence, Grade level and course Plans, and Instructional Unit Plans.
		5)	Pilot test, assess, and reorganize
		6)	Disseminate and implement
(d)	Clarifying/debugging the innovation as it is put into regular use.	7)	Evaluate and revise - the cycle is almost ready to begin again as it concludes!
(e)	Maintaining the innovation. Assuring the innovation becomes an integral part of the organizations ongoing activities.	No step that specifically corresponds, although one of the tasks of the implementation stage is to oversee the continuing use of the program.	

Adapted from Armstrong (1989), *Developing and Documenting the Curriculum* and Rogers (1983), *Diffusion of Innovation.*

Indicators of success. To conclude this section it is perhaps appropriate to identify some indicators of successful curriculum implementation. A review of the process of change in various educational contexts suggests the following indicators:

1. The materials required for instructional activities are available and regularly restocked.

2. Individuals using the curriculum automatically understand the jargon or language.

3. Graduating teachers are prepared to teach the new program.

4. Teachers in the field are using the instructional methods of the program.

5. The governing bodies (departments of education, school boards, etc.) are committed in terms of dollars and people to the program.

Using these indicators as guideposts, the final section of this paper examines the state of technology education in five selected Canadian provinces.

Technology Education in Selected Canadian Provinces *

In speaking with the practical arts directors of British Columbia, Alberta, Saskatchewan, Manitoba, and Ontario, I found that Canada is going through much of the sam educational soul-searching as is the United States. The demographics in terms of Technology Education for the provinces were similar in most cases.

All five provinces are considering name changes although some are further along in the process. Ontario has a proposal at the provincial level to change "Industrial Arts" to "Design and Technology". Manitoba's teacher association has either changed or is changing "Industrial Arts" to "Technology Education", however, that has not been proposed at the provincial education level yet (an example of change from the association approach). Alberta Education is proposing that the blanket term "Practical Arts" be changed to "Technology and Living Skills" in keeping with the curricular push in that province but has no formal proposal to change "Industrial Arts" to "Technology Education".

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* This section presents a summary of data collected through telephone interviews by Colleen Hill in February and March 1990.

When asked where Technology Education is being taught, all provinces were unanimous in saying the junior high level is where most students are being offered the program. Most provinces had little or no general Technology courses offered as a continuation of the junior high program. All five provinces claimed a general decline in students in the industrial education programs, although this is difficult to identify as the numbers fluctuate from school district to school district. The reason cited most often for this decline was the increase in number of hours in core academic subjects requirements for graduation. Most provinces said that the support for programs in terms of dollars and people was remaining the same, however, Alberta, with their 3% increase in educational funding adds up to a decline when inflation is considered.

The provinces all set the curriculum for implementation in all school districts, but several were quick to point out that there were no organized checks on what was actually being taught in the classroom as there is no standardized testing at the grade twelve leaving level such as there are in core subjects such as science, math, and language arts. The one thing that all provinces were unanimous on was that they had all recently completed or were in the midst of major curriculum reviews.

The next section will be a review of each provinces curriculum change process and where they fit into the Armstrong/Rogers Model.

British Columbia

B.C. started their comprehensive study on education in 1988. The Royal Commission has organized their education system in four strands, one of which is practical arts. The industrial arts people at the provincial level are calling themselves technology educators even though no official name change has occurred. The curriculum proposal at this point is in the process of being reported on by the government. The mandate states that the unit shop system that exists in B.C. right now be changed to the technology education approach. They are in the process of contracting curriculum specialists in technology education to begin the writing process as soon as the Royal Commission's mandate receives final approval.

Alberta

The Calgary Board of Education started their practical arts review in the fall of 1987. By February of 1988, the Board of trustees had given approval for the dollar support of a full blown task force study. At the same time the Edmonton public school board was conducting their own review. In June of 1988, Alberta Education began the provincial review of Practical Arts. By December of that

year, the initial report was sent out for review to key groups in the province. Revisions were made and by September of 1989, the proposal was scnt to all practical arts teachers and various interest groups in the province. We, as teachers, have yet to be informed of the results of that survey. The industrial arts curriculum guides were last revised in 1976 and updates are on hold pending government dollar decisions. The only curriculum writing going on at the present time is for a course on Tourism being developed through a joint effort of the Alberta Education curriculum division and Alberta Tourism. It will be piloted in the new high school in Calgary which is scheduled to open in September of 1990.

Saskatchewan

McConaghy (1990) stated that the way Saskatchewan is handling curriculum reform could "serve as a model for all of North America". "Saskatchewan didn't wait until the winds of educational change drifted north of the 49th parallel in 1983. Curriculum reform is Saskatchewan began in 1981 and will not be complete until 1998". This reform has been based on genuine consultation involving the government, the educational community and the public. Early in the process the advisory committee arranged for a discussion paper to be delivered to every household in Saskatchewan with a school-aged child. The committee also met with various educational groups. In 1984 the Report, "Directions" was released recommending a core curriculum quite different from any in other provinces. The core curriculum has two components, Common Essential Learnings (CELs) and required areas of study. The CELs are 6 areas of concentration that develop understandings, values, skills, and processes that are considered foundations for learning in all school subjects. The 6 are: communication, numeracy, critical and creative thinking, technological literacy, personal and social values and skills, and independent learning. These are strands that run across all subject areas K-12. The required courses in terms of Practical Arts are 2 courses at the middle/junior high level and 2 credits out of 24 for the three years at the high school level. The last specific rewrite of the industrial arts curriculum was in 1985, however, the CELs are being incorporated into it now.

Manitoba

Manitoba's Junior High School curriculum was set in 1983 and is now in place throughout the province. Their review of the High School program was completed in 1987 when Manitoba moved to the technology program. On review of their new high school curriculum guides I found that they still have metal work and wood work in grades 10, 11 and 12, however, they have included design and problem solving within these areas. They also have provincial dollar

support to upgrade their facilities and have provincial support in terms of personnel. At this time they have no plans for further review of the industrial arts program in the near future.

Ontario

The Ontario review of education began in 1987 and the province is going through major changes across the curriculum. They are in the midst of a review of industrial arts and they have put out the validation draft for the new junior high school curriculum which will be called "Design and Technology". They expect it will be a required course at the grade seven and eight level. The director feels that the final document is about one year away. The focus will be on design, problem-solving, and creative thinking.

The high school curriculum is being written now and will likely move toward a two-tiered system, one being a vocational route and the other entitled Technology Studies. The director feels that most students will take Technology Studies rather than the vocational courses as the Technology Studies courses will be able to be used for academic requirements for graduation and entrance into post-secondary studies. The first drafts of the Technology Studies courses are expected to be available for review in early April.

The government has allocated 60 million dollars to the Technological Studies Renewal Program which is a 5 year plan (12 million per year). Individual school boards must review their programs and show their three year plans to implement the Technological Studies programs in order to access the dollars. The provincial director stated "the dollars are available for boards to convert existing skill trade areas to broad-based technology programs". He feels that the major difference in the new curriculum is that it is taking a new delivery approach, away from individual projects and toward small group problem-solving and cooperative learning.

Summary

The Armstrong model of curriculum development and the Rogers model of change in organizations were reviewed to showed how they interacted. Armstrong's model looks at the specifics of the curriculum development process, whereas Roger's model provides a framework for moving the curriculum innovation through the organizational change process. The review of various programs indicated how these models interacted and, perhaps more importantly, how curriculum developers and individual teachers involved in the process need to use both models in their action plans for change.

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